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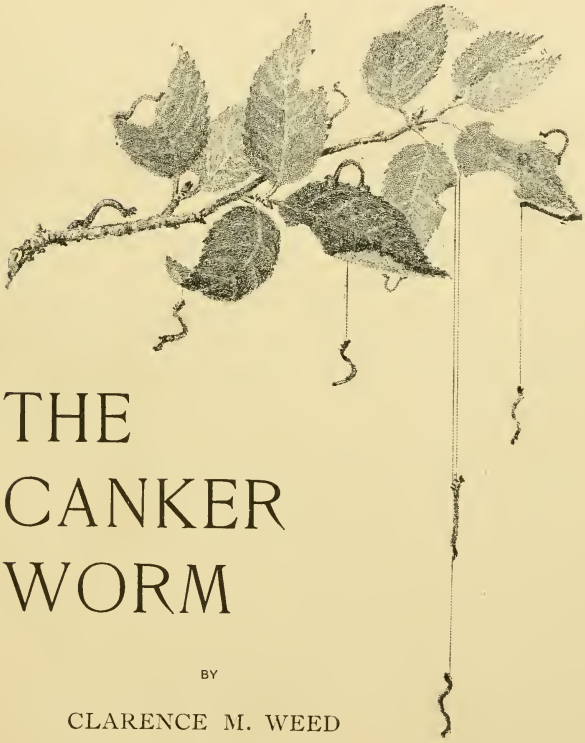

THE CANKER WORM

BY

CLARENCE M. WEED

NEW HAMPSHIRE COLLEGE

OF

AGRICULTURE AND THE MECHANIC ARTS

AGRICULTURAL EXPERIMENT STATION

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THE CANKER-WORM

BY CLARENCE M. WEED

SEVERAL of the insect pests which afflict the New England farmer in this year of grace 1897 are the same as those which burdened his ancestors a century ago. This is especially true of the canker-worm; witness these paragraphs published in 1797, by Mr. Samuel Deane in *The New England Farmer or Georgical Dictionary:*

"The worm is produced from the eggs of an earth colored bug, which having continued under ground during winter, passes up on the bodies of apple trees early in the spring. They are hatched as early as the end of May, and are so voracious, that in a few weeks they destroy all of the leaves of a tree, prevent its bearing for that year, and the next, and give it the appearance of its having been burnt. As the perspiration of trees is stopped by the loss of their leaves, they sicken and die, in a few years.

"The worms let themselves down by threads in quest of prey, like spiders; by means of which, the wind blows them from tree to tree; so that in a close orchard, not one tree will escape them. But trees which stand singly are seldomer infested with these insects. As they are the most pernicious kind of insects with which New England is now infested, if any person could invent some easy, cheap, and effectual method of subduing them, he would merit the thanks of the publick, and more especially of every owner of an orchard."

Throughout the present century the canker-worm has remained one of the most destructive orchard pests. Its structure and life habits have caused the injury in each region to be

largely localized, an orchard here and there showing by the browning of the foliage the presence of the enemy, while neighboring orchards and isolated trees remain uninjured.

THE LIFE-HISTORY OF THE CANKER-WORM

In regions where the canker-worm is present in destructive numbers one will sometimes see orchards which in June appear seared and brown as if scorched by fire. Closer examination will show that the green portions of the upper surfaces of the leaves have been eaten off, so that there remain only the veins and more or less of the withered under surface. Had you observed the trees during May you would have found myriads of looping caterpillars each busily feeding upon the succulent tissues. These canker-worms are green or brown, more or less striped with longitudinal lines. Just back of the head are six legs with pointed claws, and near the posterior end of the body are four or six other legs, different in form. When the caterpillar crawls the middle of the body assumes the shape of a hump or loop; on account of this these insects are called looping caterpillars or measuring worms. If the twig upon which they are stationed is jarred, each caterpillar drops earthward, spinning from its mouth a silken thread, which prevents too sudden a descent to the earth below.

Early in summer, the canker-worms become full-grown in the larval state. They then enter the soil two or three inches, sometimes simply seeking the shelter of the rubbish upon its surface, where, protected by silken cocoons in cells, they change to pupæ. There they remain until autumn or the following spring, when the moths emerge. In these, the sexes are strangely different; the males are small of body and large of wing, well adapted to easy flight; while the females are large of body, and wholly destitute of wings. The latter are thus doomed to pass the short remainder of their lives in the vicinity of their emergence. They crawl up the trunks of neighboring trees, where upon the twigs they deposit their eggs, dying soon afterwards. When the leaves appear, bursting through the buds, the eggs hatch into the young caterpillars, that feed upon the tender foliage.

There are two distinct species of canker-worms, the fall canker-worm (*Anisopteryx pometaria*) and the spring canker-worm (*Paleacrita vernata*). The moths of the former emerge mostly in autumn, while those of the latter appear in spring. The various stages of the spring species are represented in Fig. 2, and of the fall species in Fig. 3. As will be seen, the insects resemble each other, one of the chief differences being in the shape of the egg (see *b* in each figure). Both species are found in New Hampshire.

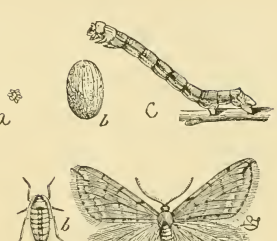


FIG. 2.—The spring canker-worm: *a*, egg mass, natural size; *b*, egg, magnified; *c*, larva; *d*, female moth; *e*, male moth. (After Riley.)

The canker-worm is distributed largely through the action of the wind in blowing suspended larvæ from one tree to the vicinity of another. Lowell has described the process in these lines:

> "The worm, by trustful instinct led,
> Draws from its womb a slender thread
> And drops, confiding that the breeze
> Will waft it to unpastured trees."

THE ENEMIES OF THE CANKER-WORM

Fortunately, the canker-worm is beset by enemies from the time the egg is laid until the adult moth dies. There is a tiny parasite which develops in the egg, destroying its contents. There are several species of parasites which prey upon the larvæ, as well as various predaceous insects which devour it bodily. But perhaps the most effective enemies are the birds; repeated observations and investigations have shown that nearly all our common birds feed freely on the canker-worm. Apparently, no other injurious insect is taken so freely by a great variety of birds. The observations made in Massachusetts, by Mr. C. E. Bailey, and reported by Mr. E. H.

Forbush[1] show that the chickadee, or black-capped titmouse, devours the eggs throughout the winter, and the moths when they are present. "Mr. Bailey is very positive that each chickadee will devour on the average thirty female canker-worm moths per day from the twentieth of March until the fifteenth of April, provided these insects are plentiful. If the average number of eggs laid by each female is 185, one chickadee would thus destroy in one day, 5,550 eggs; and in the twenty-five days in which the canker-worm moths crawl up the trees, 138,750. It may be thought that this computation is excessive, and it is probable that some of the moths were not captured until they had laid some of their eggs, but the

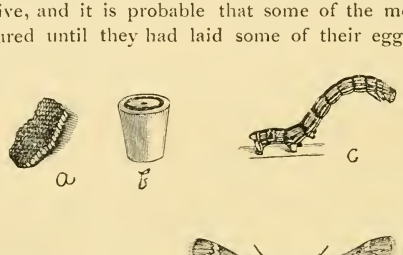


FIG. 3.—The fall canker-worm; *a*, egg mass, natural size; *b*, egg, magnified; *c*, larva; *d*, pupa; *e*, female moth; *f*, male moth. (After Riley.)

chickadees are also busy eating these eggs. When we consider further that forty-one of these insects, distended as they were with eggs, were found at one time in the stomach of one chickadee, and that the digestion of the bird is so rapid that its stomach was probably filled several times daily, the estimate made by Mr. Bailey seems a very conservative one. He now regards the chickadee as the best friend the farmer has, for the reason that it is with him all the year, and there is no bird that compares with it in destroying the female moths

[1] Mass. Crop Report, July, 1895.

and their eggs." Similar evidence concerning the value of various other birds as canker-worm destroyers could be readily adduced, did space permit. There is no question that the encouragement of the presence of birds is a quality of mercy that is twice blessed, for it blesseth him that gives and those that receive.

PREVENTING THE INJURY

The injuries of the canker-worm may be prevented in two ways: If the trunk of the tree be smeared with some preparation which will prevent the female moths or the worms from ascending it, no injury can result. This device is frequently employed, heavy wrapping paper smeared with printer's ink or some similar viscid substance being fastened around the trunk of the tree (Fig. 4). There are now upon the market two preparations called *raupenleim* and *dendrolene* which are used in place of printer's ink and serve the purpose very well. They remain sticky for a long time. Various mechanical appliances, in the shape of tin troughs and bands, are also used to accomplish the same object.

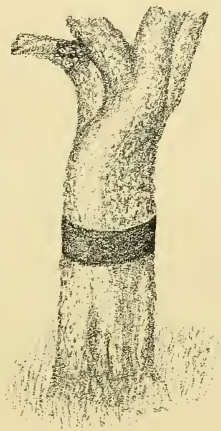


FIG. 4.—Trunk of tree, showing paper band. (Original.)

This banding method is particularly serviceable in protecting large elm trees, which are difficult to spray on account of their height. The loose bark should be carefully scraped off the portion of the trunk which is to be covered by the paper, before the latter is put on; and it is generally worth while to insert a thin layer of cotton waste, or some similar material, beneath the paper to fill up crevices, and thus prevent any moths or worms from crawling through beneath the paper. Then the dendrolene or raupenleim may be smeared upon the paper to the thickness of about one-fourth of an inch, and left as long as it remains sufficiently sticky to entrap any insect that

attempts to pass over it. Either of these substances will remain for two or three months in a sticky condition. To prevent canker-worm injury, an application early in March, and another the first of September will probably suffice. It has sometimes been recommended to smear raupenleim and dendrolene directly upon the bark of the tree, but recent experience has shown that there is danger of thus injuring the tree through the absorption of the materials of which the application is composed. It is probably worth while to take a little

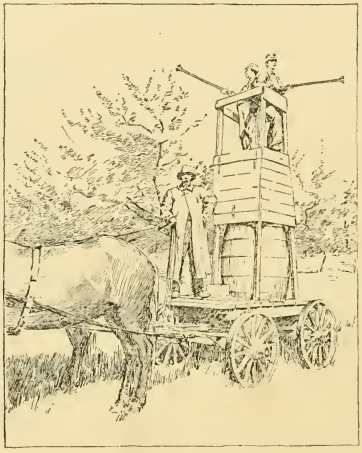


FIG. 5.—A New York spraying outfit. (After Bailey.)

more trouble and use the paper, rather than run any risk of loss. The dendrolene may be purchased of the Bowker Fertilizer Company, of Boston, and the raupenleim of William Menzel & Son, 64 Broad St., New York, N. Y.

If thoroughly applied, the bands being kept on throughout the entire season, during which the moths and caterpillars appear—from September till June—this banding method is easily applicable to orchard practice. In cases where the attack the previous season was severe, it will generally pay to apply the bands, even if the orchardist expects to spray his

trees, for it has been the general experience that an orchard badly infested by canker-worms cannot be wholly freed from the pests the first season, before considerable damage is done to the foliage. Some New Hampshire farmers have told me they preferred to fight the canker-worm by the banding, rather than the spraying, method, because their other work kept them so busy during the spraying season. But, in general, the orchardist will find it profitable to spray, because he can thus kill off not only the canker-worms and other leaf-eating insects, but the codling-moth as well, and if he so desires, he can in the same mixture fight the apple scab and other fungous diseases.

When an orchard is infested by canker-worms it is very desirable to spray once before the blossoms open. The insects begin hatching early in the season; if trees are not sprayed until after the blossoms fall, considerable damage will be done before the worms are killed. One spraying when the buds are in the condition represented in Fig. 6 will be of much service. Another should be given as soon as the blossoms fall; and if the canker-worms are very numerous a third—a week or ten days after the second—will be desirable.

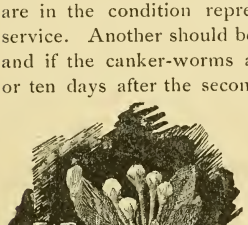
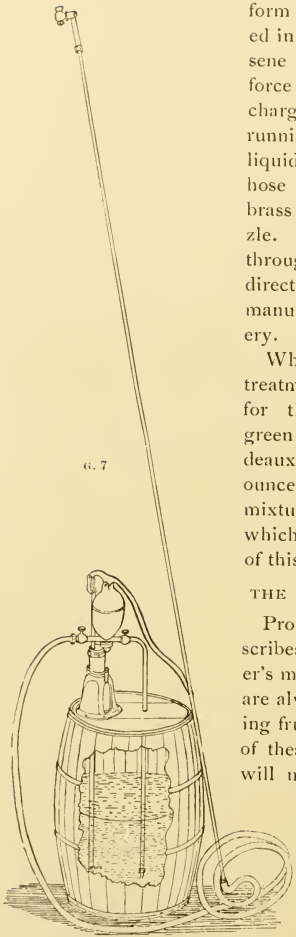


FIG. 6.—Time to spray. (After Bailey.)

For insects alone the best mixture to use in apple-orchards is probably Paris green, one pound to two hundred gallons of water with two pounds of fresh-slacked lime added to render all the arsenic insoluble and thus prevent injury to foliage.

Repeated experience has demonstrated that spraying must be thoroughly done to be effective. The leaves throughout the tree must be wet with the spray. In this work haste is waste; a stitch in time will save many times nine.

The ease with which spraying is carried on depends to a considerable extent upon the facilities provided. The outfit shown in Fig. 5 is used by a New York fruit grower. Many other forms of outfits have been made and successfully employed. It is, of course, a distinct advantage to apply the spray from some distance from the ground. For small orchards a simple



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form of spraying outfit is represented in Fig. 7. It consists of a kerosene barrel holding fifty gallons, a force pump having a double discharge, with a short line of hose running into the barrel to keep the liquid stirred, and a long line of hose fitted at the end to a slender brass rod tipped with a spray nozzle. This outfit can be obtained through any hardware dealer, or direct from any of the numerous manufacturers of spraying machinery.

Where it is desired to combine the treatment for apple scab with that for the canker-worm, the Paris green may be added to the Bordeaux mixture at the rate of four ounces of poison to fifty gallons of the mixture, full directions for making which will be found in Bulletin 45 of this Station.

THE FRUIT GROWER'S INSURANCE

Professor L. H. Bailey wisely describes spraying as the fruit grower's method of insurance. "There are always elements of risk in growing fruit," he writes. "The chief of these is frost, a difficulty which will never be completely under our control. The second great element of risk is the injury wrought by insects and fungi, and the greater part of this injury can be averted by the sprays. Now, it is

impossible to foretell by any considerable length of time, if any or all of the difficulties which are liable to harass the fruit raiser will actually appear. One does not know if his buildings will burn, yet he insures them. We know that in four years out of five, some serious injury of insects or fungi may be confidently expected, and it is the part of wisdom to insure against it.

"Last year, 1894, was a season of remarkable invasion of apple-scab fungus, and those persons who sprayed their orchards thoroughly had phenomenal results. These experiences, aided by many publications upon the subject, so advertised the value of the sprays that much more spraying was done in the state this year than ever before. But it has so happened, probably because of the dry spring, that comparatively few invasions of enemies have occurred this year; and the sprays have generally given small results. There has now arisen, therefore, considerable indifference or even opposition to spraying, and I expect to see much less of it next spring than I saw this spring. If, then, next year should be prolific in insects and diseases, there will be a few orchards here and there which will reward the forethought of the owner, and very many others which will be monuments of the results of neglect. It is a common fault with farmers that they draw their conclusions from the behavior or experiences of each recurring season, and do not consider the aggregate results of a series of years. Every operation should rest upon some fundamental reason or philosophy, rather than upon any single half-understood experience."

The year 1896 was remarkable for a phenomenal apple crop and consequent low prices. Presumably, 1897 will see a small apple crop and high prices. The small crop will be liable to much greater injury from insect enemies than a larger one would be. Consequently, it seems fair to conclude that where trees blossom and set fruit freely it will pay to take a little trouble to get it matured in good condition.

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